2014-1487
(U.S. Patent No. 7,631,473)

United States Court of Appeals for the Federal Circuit

IN RE NAS NALLE AUTOMATION SYSTEMS

Appeal from the United States Patent and Trademark Office, Patent Trial and Appeal Board

BRIEF OF APPELLANT

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Counsel for Appellant

AUGUST 8, 2014

CERTIFICATE OF INTEREST

Counsel for Appellant certifies the following:

1. The full name of every party represented by me is NAS Nalle Automation Systems, LLC.

2. The name of the real party in interest represented by me is NAS Nalle Automation Systems, LLC.

3. All parent corporations and any publicly held companies that own 10 percent or more of the stock of the party or amicus curiae represented by me are: None

4. The names of all law firms and the partners or associates that appeared for the party or amicus now represented by me in the trial court or agency or are expected to appear in this court are:

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Dated: August 8, 2014

/s/ Andrew C. Lake
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Counsel for Appellant

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STATEMENT OF RELATED CASES

The patent-at-issue in this Appeal is involved in concurrent litigation before the United States District Court, District of South Carolina, Docket 6:10-CV-2462-TMC. This District Court action has been stayed pending this *ex parte* reexamination proceeding.

The Appellant is not aware of any other appeals, judicial proceedings, or interferences which may be related to, directly affect or be directly affected by or have a bearing on this Court's decision in the pending appeal.

STATEMENT OF JURISDICTION

This appeal arises from a final Decision on Appeal of the Patent Trial and Appeal Board of the U.S. Patent & Trademark Office ("Board") in an *ex parte* reexamination patent case.

A. The statutory basis for jurisdiction of the Board is 35 U.S.C. §§ 6 and 134.

B. The statutory basis for jurisdiction of this Court is 35 U.S.C. § 141(b).

C. Appellant timely filed a Notice of Appeal with this Court on April 8, 2014 from the Board's final and appealable Decision on Appeal issued February 26, 2014.

STATEMENT OF THE ISSUES

1. Whether the Board erred by finding it would have been obvious to combine the prior art '295 Williams cutting and sealing unit – which uses a hot blade to cut and seal polymer film by melting the film – with the prior art '213 Shanklin patent – which uses a retractable, sharp serrated blade to cut polymer film by mechanical shearing – to arrive at a cutter sealer which is adapted to soften the film without liquefying the film to cut and seal the film, as claimed.

2. Whether the Board erred by failing to consider the patent owner's evidence showing that the claimed invention solved a long felt

maintenance problem associated with sharp cutting blades in the cutter-sealer field.

STATEMENT OF THE CASE

On December 15, 2009, the United States Patent & Trademark Office issued U.S. Patent No. 7,631,473 to Thomas A. Nalle, III ("the '473 patent"), including claims 1-4. **A912**

On October 14, 2011, a third-party request for *Ex Parte* reexamination of the '473 patent was filed alleging twenty-one new questions of patentability against claims 1-4. **A33** *et seq.*

On March 15, 2012, the examiner issued a non-final office action rejecting claims 1-4 under 35 U.S.C. §§ 102 and 103 primarily over Rennco Inc. *Packaging Machines and Systems Field Modifications and Upgrades* (Nov. 1, 2002) ("Rennco"), Bell (U.S. Patent No. 6,425,848), and Williams (U.S. Patent No. 5,056,295), either separately or in various combinations with Hosso (U.S. Patent No. 3,035,381), Shanklin (U.S. Patent No. 5,131,213), and McClean (U.S. Patent No. 4,317,697). **A450** *et seq.*

On April 16, 2012, the Patent Owner filed an Amendment adding new claims 5-8 and traversing the examiner's rejections of claims 1-4. **A480** *et seq.* The Patent Owner also submitted Declarations from Dr. Jamil Khan and Mr. Sam Scott. *Id.*

On May 30, 2012, the Patent Owner filed a Supplemental Amendment correcting an informality. **A499** *et seq.*

On September 17, 2012, the examiner issued a final office action rejecting claims 1-8 as being either anticipated or obvious primarily over Bell, either separately or in combination with Rennco or Hosso. **A515** *et seq.* The Examiner also rejected claims 1-3 and 5-8 as being obvious over Williams in view of Rennco or Hosso, and further in view of Shanklin. *Id.*

On November 16, 2012, Appellant filed a Notice of Appeal to the Board, A622, and filed his Appeal Brief on March 18, 2013. **A684** *et seq*. The examiner filed an Answer on May 3, 2013. **A753** *et seq.*

An oral hearing was held on October 23, 2013. **A855** *et seq.*

The Board issued a Decision on Appeal on February 26, 2014 affirming the examiner's Williams-based rejection of claims 1-3 and 5-8, but reversing the examiner's Bell-based rejection of claim 4. **A1** *et seq.*

Appellant timely filed a Notice of Appeal to the Court of Appeals for the Federal Circuit on April 8, 2014. **A872** *et seq.*

STATEMENT OF THE FACTS

A. Background and Claims of the Invention

The invention claimed in the '473 patent solved several deficiencies in prior cutter-sealer machines by providing a cutter-sealer having a cutting blade

adapted to soften layers of polymer film along a cutting edge of the blade without liquefying the layers of film, and enabling the cutting blade to travel through the layers of film to divide and seal the layers of film without liquefying the layers of film, thus solving maintenance problems associated with prior art cutter-sealers.

To that end, independent claim 1, which is representative of the '473 patent, reads as follows (italics added to highlight relevant features):

1. A cutter-sealer for cutting and sealing layers of film, said cutter-sealer comprising:

a blade for being selectively heated and for cutting and sealing the layers of film, said blade having:

a cutting section with a distal portion defining a cutting edge, *said cutting edge being adapted to transfer heat from said blade to the layers of film sufficient to soften a portion of the layers of film along said cutting edge without liquifying the layers of film*; and

at least one first blade shoulder fixed proximate said cutting section rearward of said cutting section, said at least one first blade shoulder being adapted to transfer heat to the layers of film; and

a second blade shoulder fixed proximate said cutting section and oppositely disposed to said first blade shoulder;

wherein said blade defines a heater receptacle adapted for receiving a heating element;

a seal pad fabricated of a flexible material, said seal pad defining a seal pad slot adapted for receiving at least a portion of said cutting section of said blade, said seal pad further defining at least a first contact surface proximate said seal pad slot adapted to cooperate with said at least one first blade shoulder to engage the layers of film and press the layers of film together, said seal pad further defining a second contact surface proximate said seal pad slot;

a seal pad caddy for carrying said seal pad, wherein said seal pad caddy defines at least a first material fixation surface; and

a means for selectively securing the layers of film proximate said seal pad slot, wherein said means for securing the layers of film proximate said seal pad slot includes at least one film clamp adapted to cooperate with said first material fixation surface to engage the layers of film and hold the layers of film tautly across said seal pad slot;

whereby after said cutting edge contacts the layers of film to heat and soften the layers of film without liquefying the layers of film, at least a portion of said cutting section of said blade travels through the layers of film and into said seal pad slot, thereby dividing the layers of film and allowing said at least one first blade shoulder to press the layers of divided film against said at least one first contact surface to accomplish sealing of the layers of divided film and whereby at least a portion of the layers of divided film are pressed between said second blade shoulder and said second contact surface to accomplish the sealing of the layers of film.

A919-A920.

Figures 2, **A914**, and 4, **A915**, of the ‘473 patent illustrate these claimed features well:

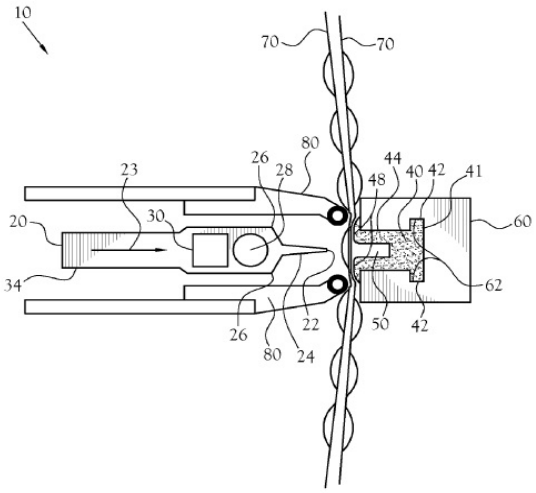


Fig.4

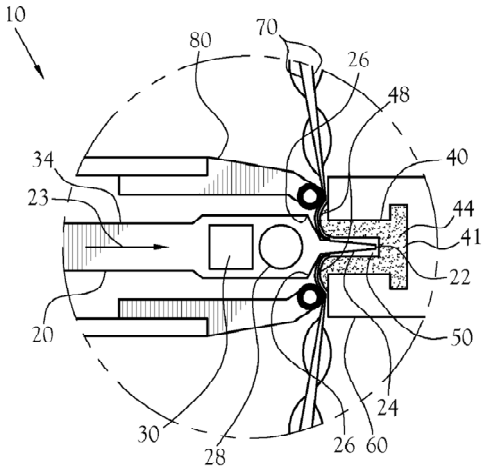


Fig.2

B. The Patent Office's Rejection

In sustaining the examiner's rejection of claims 1-3 and 5-8 primarily over Williams, the Board stated:

> - "…one of ordinary skill in the art could have modified Williams' cutting and sealing unit *14* to heat the blade to a point where good seals are made at a considerably lower temperature than the melting point of the film as taught by Shanklin to prevent the film from melting and gumming up the blade and seal pad **while maintaining the function of cutting layers of plastic film**." [emphasis added]; **A22**.
>
> -"The Patent Owner has not established either that the claimed subject matter has been commercially successful or that the subject matter has satisfied a long felt but unmet need in the art." **A23.**
>
> -"It is reasonable to infer that blade *16* is capable of shearing via a pass through cut, a suitably thin film having suitable physical properties even when the portions of the layers of film near the blade are heated below that material's melting point." **A10.**

There is no factual or expert explanation anywhere in the examiner's office actions, the examiner's appeal briefing, or in the Board's decision as to how or why a person skilled in the art could combine Williams' hot-blade melting system with Shanklin's retractable serrated blade cutter-sealer system, to arrive at the claimed invention.

The Board's decision can be summarized as follows:

- A sharp, retractable, serrated cutting blade that cuts layers of polymer film by mechanical shearing (Shanklin) suggests that a hot cutting blade that cuts layers of polymer film by melting (Williams) can cut the layers of film *without* melting.

C. The Patent Office Theorizes About How The '295 Williams Device Can Be Modified To Cut Without Melting

The Board asserts that one of ordinary skill in the art could have modified Williams' cutting and sealing unit 14 according to Shanklin's retractable, serrated cutting blade to heat the blade to a temperature considerably below the melting point of the film while maintaining the function of cutting layers of film. *See e.g.* **A22**.

The Board also asserts "it is reasonable to infer", **A10**, that the Williams machine is capable of shearing layers of film via a pass through cut even when the portions of the layers of film near the blade are heated below that material's melting point.

Thus, on the one hand the Board is saying it would have been obvious to modify Williams according to Shanklin to cut layers of polymer film without melting. On the other hand the Board appears to be saying "it is reasonable to infer" that Williams is alone capable of cutting layers of film without melting the film, irrespective of Shanklin.

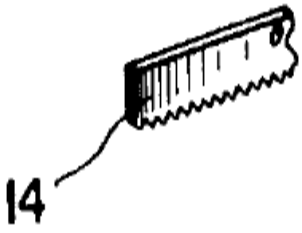
In both cases, the Board does not provide any basis in fact and/or technical reasoning to reasonably support either of these conclusions. The Board hypothesizes, without any support whatsoever, that Williams could be transformed from a melting system into a non-melting system, by adopting Shanklin's retractable, serrated blade cutter. The Board also speculates that there may be some hypothetical film referred to as a "suitably thin film having

suitable physical properties" that would allow Williams to cut the film without melting.

The Board ignores the fact that Shanklin is an entirely different type of cutter-sealer that uses a sharp, retractable, serrated cutting blade to cut film without melting, whereas Williams is a melting system that cuts film by melting the film. Both types of systems were well-known for many years in the art at the time of the present invention, and the respective systems are constructed differently and operate in a substantially different way. Moreover, each system presented long-standing maintenance problems that had not been solved prior to the invention of the '473 patent.

The following images from FIG. 3 of the '213 Shanklin patent, **A907**, and FIG 3B of the '295 Williams patent, **A900**, are reproduced below for illustrative context:

Shanklin (Fig. 3)



Williams (Fig. 3B)

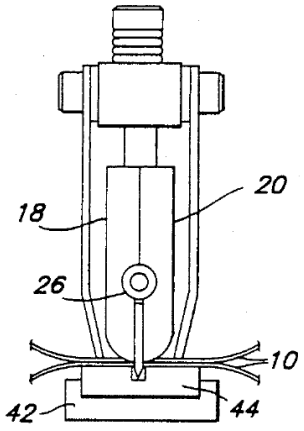


FIG. 3B

Williams is a melting system. Shanklin is a mechanical shear-cutting system. There is no question about this. The Board acknowledged that "…applying heat to fuse the film ends implies Williams' unit *14* heats the portion of the film near the blade *16* above the melting point," **A9**.

Nevertheless, the Board concludes, without any factual support or teaching in the prior art, and contrary to expert testimony, that:

> - "…one of ordinary skill in the art could have modified Williams' cutting and sealing unit 14 to heat the blade to a point where good seals are made at a considerably lower temperature than the melting point of the film as taught by Shanklin to prevent the film from melting and gumming up the blade and seal pad while maintaining the function of cutting layers of plastic film." **A22**.

During the course of this reexamination proceeding, Appellant submitted a pair of Declarations from an expert in the field of cutter-sealers, Dr. Jamil A. Khan, who concluded, among other things, that the device described by the Williams patent cannot be modified to initiate a cut at temperatures below the melting point of polymer film, but instead will only work if the blade heats the sheets to above the melting point of the polymer film to cut the film by melting. See, e.g., Declaration of Dr. Jamil A. Khan dated April 14, 2012, ("first Khan Decl."), at ¶¶ 11 and 17, **A487**, **A490**; and Declaration of Dr. Jamil A. Khan dated October 17, 2012, ("second Khan Decl.") at ¶¶ 8 and 9, **A609-A612**. Dr. Khan's credibility and credentials have never been questioned in this case.

Dr. Khan also concluded that, "When the cutting edge is shaped to physically cut the polymer sheets without melting the polymer, higher stress levels are required to mechanically cut the polymer layers at lower temperatures, which can lead to incomplete and faulty cuts if the cutting blade is left unchecked." (First Khan Decl., at ¶8), **A486**.

Dr. Khan also concluded that, "Attempting to redesign each system component and modify the mechanical cutting blade to arrive at a cutting blade that is adapted to transfer heat sufficient to soften the film without liquefying the film would be a task of no certain success. (First Khan Decl., at ¶ 18) **A491**.

The '213 Shanklin patent explains in column 1, lines 43-48, **A909**, that the main difficulty with hot-knife melting systems is that the distance the knife blade protrudes is very critical if the jaw is to provide the proper sealing pressure and the proper cutting pressure simultaneously. Shanklin also acknowledges in column 1, lines 52-57, **A909**, that one of the problems associated with sharp knife systems is the difficulty in obtaining good cuts unless the knife is kept very sharp.

SUMMARY OF ARGUMENT

The Patent Office has failed to provide any basis in fact and/or technical reasoning to support its determination that Williams is capable of cutting polymer film without melting the film. *Ex parte Levy*, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990) ("the examiner must provide a basis in fact and/or

technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art.")

The Patent Office has improperly sustained a rejection with conclusory statements that do not provide some articulated reasoning with rational underpinning to support the legal conclusion of obviousness, and has failed to take into account technological difficulties associated with the proposed combination of references. *In Re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) ("rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.") MPEP § 2141.

The Patent Office has failed to show that transforming the Williams device from a melting system to a non-melting system would achieve predictable, successful results cutting and sealing polymer layers of film for the packaging industry. *In re Rinehart*, 531 F.2d 1048, 1053-54 (CCPA 1976).

The Patent Office has failed to properly consider all of the evidence of patentability, including secondary evidence of patentability submitted by the applicant, to determine patentability. *Id.* at 1052.

ARGUMENT

A. Standard of Review

The Patent Office's determinations of obviousness are reviewable *de novo* and its underlying factual determinations are reviewable for "substantial evidence." *In re Kotzab*, 217 F.3d 1365, 1369 (Fed. Cir. 2000), *In re Gartside*, 203 F.3d 1305, 1316 (Fed. Cir. 2000), *Dickinson v. Zurko*, 527 U.S. 150, 152-53 (1999).

B. The Patent Office's Rejection Ignores Practical Engineering Considerations Of Different Types of Cutter-Sealers

The Patent Office has erroneously concluded that one of ordinary skill in the art could transform Williams from a melting system to a non-melting system in view of Shanklin's serrated-blade cutting system. In doing so, the Patent Office has overlooked a number of engineering design considerations pertinent to the respective machines that enable successful operation of the machines at the speed and quality with which they must operate in a competitive marketplace.

Shanklin uses a sharp, retractable, serrated cutting blade to cut sheets of polymer film under shearing stress at non-melting temperatures. Shanklin provides a host of interrelated component parts including compression springs 36, 37 and yokes 209, 21, 32, 33 enabling Shanklin's serrated blade 14 to force its way through the film and retract back into the sealing jaws 11, 12 after the seal jaws have contacted the film (see, e.g., FIG. 3 of Shanklin at **A907**). In

contrast, Williams provides a heater receptacle 28 to transfer heat to the cutting blade 16. Williams' blade 16 is necessarily formed to withstand heat from the heater receptacle 28, and the blade 16 extends beyond the seal bars 18, 20 to contact the film before the seal bars 18, 20 ever contact the film (see, e.g, FIGS 2A to 3B of Williams at **A900**. Williams' blade is not retractable.

In view of these differences, it follows logically that the respective elements and component parts that are exclusive to the Shanklin and Williams designs are not interchangeable between the respective machines.

The Background section of Shanklin makes clear there are several different types of systems in the prior art, all of which either seal and cut the packaging film by forcing heated sealing and cutting elements against an elastomeric cushioned bed at a temperature sufficient to make a clean cut by melting the film, or a variation of these systems which use a sharp knife which cuts the film by forcing the film into a slot in the elastomer bed. Col. 1, lines 20-55. **A909**.

These statements are corroborated by expert Dr. Khan who has declared that the known prior art cutter-sealers either use heat to cut and form a seal between the edges of sheets of polymer, or instead of melting the polymer with a heated blade, they use a blade shaped to physically shear the polymer sheets using cutting pressure against an anvil or within a slot. (First Khan Decl., ¶¶ 4 and 6). **A485**.

Shanklin and Dr. Khan agree that one of the main difficulties with the hot-knife systems is that the temperature required to make a clean cut melts the film such that molten film will gum up on the knife and the sealing surfaces requiring frequent maintenance and cleaning. *Compare,* Shanklin, Col. 1, lines 30-37, **A909**, and first Khan Decl. ¶¶ 5 and 7, **A485**. As to the mechanical shear cutting systems, Shanklin and Dr. Khan agree it is difficult to obtain good cuts unless the knife is kept very sharp, which can result in polymer film tending to stick to the knife rendering the system inoperable. *Compare* Shanklin Col. 1, lines 56-60). **A909**, and first Khan Decl. ¶8, **A486**.

The Patent Office never explains how it would be possible to transform the Williams hot-melting system into a non-melting system to arrive at the claimed invention, which provides a cutter-sealer having a cutting blade adapted to soften layers of polymer film along a cutting edge of the blade without liquefying the layers of film to enable the cutting blade to travel through the layers of film to divide and seal the layers of film without liquefying the layers of film.

Even assuming *arguendo* it would be possible to transform Williams into a non-melting system, this would require a radical redesign of the Williams machine and interactive components to convert it from a melting system into a non-melting system.

Moreover, the Board's re-invention of Williams would not meet all of the express limitations of claim 1 of the '473 patent. Shanklin uses a pair of sealing

jaws 11, 12 which are configured to seal the film BEFORE the sharp, retractable, serrated knife is driven through the film, whereas the '473 patent seals the layers of film AFTER the layers of film have been divided.

With regard to Rennco and Hosso, they are secondarily relied upon by the Patent Office merely to allege that they teach a pair of film clamps, as further claimed in the '473 patent. **A13-A14.** However, even assuming *arguendo* this is true (which it is not), such teaching by Rennco and/or Hosso does not remedy the deficiencies of Williams and Shanklin as relates to a cutting blade adapted to soften layers of polymer film along a cutting edge of the blade without liquefying the layers of film, and enabling the cutting blade to travel through the layers of film to divide and seal the layers of film without liquefying the layers of film, as discussed above.

Thus, even assuming it would be possible to combine Williams and Shanklin as proposed by the Board (which it is not), the Board's re-invention of Williams would not literally meet the claimed limitation of "whereby **after** said cutting edge contacts the layers of film to heat and soften the layers of film without liquefying the layers of film, at least a portion of said cutting section of said blade travels through the layers of film and into said seal pad slot, thereby dividing the layers of film and allowing said at least one first blade shoulder to press the layers of divided film against said at least one first contact surface to accomplish sealing of the layers of divided film," as claimed in claim 1 of the '473 patent. *See e.g.* **A920-A921.**

C. The Patent Office's Rejection Is Based on Speculation Of What Might Occur From A Hypothetical Set of Circumstances

The Board hypothesizes without any basis in fact or suggestion in the prior art that Williams' blade 16 could be capable of cutting a hypothetical suitably thin film having undefined physical properties via a pass through cut even when the layers of film are heated below that material's melting point. **A10.**

The Board does not support this hypothesis with any basis in fact, let alone "substantial evidence." For example, the Board did not consider any physical properties or characteristics of polymer films that are necessary for use in the packaging field, such as temperature dependent yield strength properties of polymer films. The Board merely concludes that suitable (however undefined) thin film having suitable (however undefined) physical properties may be successfully cut by Williams without melting. ***Id.***

The Board's position is speculative. It is also contrary to expert testimony of record. Dr. Khan declared that to initiate shear or separation of suitable polymer films, the applied stress has to be above the yield strength, and as the cutting temperature is decreased, the stress required to accomplish a cut is increased. (*see, e.g.*, first Khan Decl., ¶ 10) **A487**. This implies the importance of increasing the stress level of the blade relative to the film to accomplish a good cut when the temperature of the blade is reduced.

Moreover, it is improper for the Patent Office to hypothesize that a certain result or characteristic may occur or be present in the prior art without providing a basis in fact and/or technical reasoning to support a determination that the missing characteristic necessarily flows from the teachings of the applied prior art. *In re Oelrich*, 666 F.2d 578, 581-82 (CCPA 1981). This Court has also held that inherency may not be established by probabilities or possibilities. *In re Robertson*, 169 F.3d 743, 745 (Fed. Cir. 1999). The Patent Office speculates that Williams is capable of cutting some unidentified thin film with undefined properties without melting. But this conclusory statement is not supported by any facts in the record. It is also contrary to expert testimony submitted by Appellant which concluded, based on expert review, inspection, and comparison, that the Williams device must cut the film by melting, and cannot achieve a good cut without melting. (See, e.g., first Khan Decl., ¶8) **A610**.

The Board dismissed the experiment conducted by Dr. Khan in an attempt to dispute his expert conclusion that Williams cannot function at temperatures below the melting point of polyethylene. However, before the experiment was ever conducted, Dr. Khan had already reviewed, inspected, and analyzed the dimensions and specifications of the Williams device, leading Dr. Khan to unequivocally conclude that the Williams device cannot initiate a cut at temperatures below the melting point of the sheets, and will only work if the film is heated to above the melting point of the polymer film. See, e.g., first

Khan Decl., at ¶¶ 11 and 17, **A487**, **A490**; and second Khan Decl., at ¶¶ 8 and 9, **A609-A612**. This conclusion was based on expert analysis and inspection of the Williams device, and not on the results of any given experiment.

Since Dr. Khan's experiment was only conducted to reaffirm his earlier conclusion, the Board's criticism of Dr. Khan's experiment as somehow incomplete is of no moment. Moreover, it is noted that Dr. Khan's conclusion is entirely consistent with the Background section of Shanklin, which sets forth a host of difficulties, such as residue buildup and maintaining sharp blades, associated with maintaining good cuts and seals with known cutter systems that require high temperatures or sharp cutters against anvils to make a clean cut in plastic film. (col. 1, lines 48-52). **A909.**

The Patent Office has substituted its own unsupported speculation in place of expert testimony and the known deficiencies of prior art systems to "infer" that Williams' melting system could be easily adapted to cut layers of film when the film is heated below the material's melting point.

D. The Board's Modification of Williams Does Not Solve the Problems Associated with Sharp Cutting Blades

Even assuming the Board's own re-invention of the Williams hot-blade device into a mechanical shear cutting system as taught by Shanklin might solve the problem of excessive residue buildup on the blade, as contended by the Board, the redesign of Williams would not solve the additional severe maintenance problem associated with maintaining the cutting edge of the

cutting blade very sharp in order to achieve good cuts. The Board never addressed the fact that the '473 patent solved this long-felt but unmet need.

In addition to keeping the blade sharp, the '473 patent also solved the problem associated with angel-hair buildup which can accumulate on a cutting blade when the cutting edge becomes dull. Here again, Shanklin and Dr. Khan agree that a problem existed in the art with debris collecting on such a blade. And the Board's proposed redesign of Williams would not solve this problem using Shanklin's serrated blade to cut film by mechanical shearing, since the blade would tend to push the film down into the slot of the seal pad. See second Khan Decl. at ¶ 6. **A608-A609**. Shanklin, Col. 1, lines 52-60, **A909**.

Evidence of long-felt need requires: (1) objective evidence that the problem was a persistent one that was recognized by those of ordinary skill in the art. *In re Gershon*, 372 F.2d 535, 539 (CCPA 1967), and (2) the long-felt need must not have been satisfied by another before the invention by applicant. *Newell Companies v. Kenney Mfg. Co.*, 864 F.2d 757, 768 (Fed. Cir. 1988).

The evidence submitted by Appellant satisfies both prongs of the test. First, the Background section of Shanklin makes clear that at least as early as 1991, over 13 years prior to the earliest priority date of the '473 patent, that a problem existed in the art with mechanical cutting systems with regard to keeping the blade free of debris, and in obtaining good cuts unless the knife is kept very sharp. (Shanklin, col. 1,lines 56-60) **A909**. These problems are corroborated by Dr. Khan in expert testimony submitted in this case.

Second, there is no evidence presented by the Patent Office showing these needs were fulfilled by the prior art.

Appellant has presented evidence showing that the Board has misapprehended the workings of the prior art, has ignored the long-felt needs which were solved by the claimed invention, and has gone against the conclusions of expert testimony from an expert in the field of cutter-sealers.

Accordingly, the legal standard of "a preponderance of the evidence" has not been met by the Examiner, and reversal of the Examiner's rejections is respectfully requested.

CONCLUSION

For the reasons stated, it is respectfully submitted that the Patent Office's Decision is erroneous and should be reversed.

Dated: August 8, 2014

Respectfully submitted,

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ADDENDUM

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
90/011,957	10/14/2011	Thomas A. Nalle, III	37384.91	8449

22465 7590 02/26/2014

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EXAMINER	
DEMILLE, DANTON D	
ART UNIT	PAPER NUMBER
3993	
MAIL DATE	DELIVERY MODE
02/26/2014	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte NAS NALLE AUTOMATION SYSTEMS, LLC
Appellant, Patent Owner

Appeal 2013-009041
Reexamination Control 90/011,957
Patent No. US 7,631,473 B2[1]
Technology Center 3900

Before STEVEN D.A. McCARTHY, JEFFREY B. ROBERTSON and DANIEL S. SONG, *Administrative Patent Judges*.

McCARTHY, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

The Appellant/Patent Owner appeals from a Final Office Action in Ex Parte Reexamination mailed September 17, 2012 ("Final Rejection" or "Final Rej'n"). Original, unamended claims 1-4 and new claims 5-8 are subject to reexamination. An oral hearing was held on October 23, 2013.

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[1] Issued December 15, 2009 to Thomas A. Nalle, III (the "'473 patent"). The '473 patent issued from Appl. No. 12/019,040, filed January 24, 2008.

We have jurisdiction under 35 U.S.C. § 134(b) (2011) and 35 U.S.C § 306 (2011).

We sustain the Examiner's rejection of claims 1-3 and 5-8 under 35 U.S.C. § 103(a) (2011) as being unpatentable over Williams (US 5,056,295, issued Oct. 15, 1991); either Rennco Inc., *Packaging Machines & Systems Field Modifications and Upgrades* (Nov. 1, 2002)("Rennco") or Hosso (US 3,035,381, issued May 22, 1962); and Shanklin (US 5,131,213, issued Jul. 21, 1992) (Final Rej'n 11 and 15).

We do not sustain the rejection of claims 1-6 and 8 under 35 U.S.C. § 102(b) (2011) as being anticipated by Bell (US 6,425,848 B2, issued Jul. 30, 2002) (Final Rej'n 2); the rejection of claim 7 under 35 U.S.C. § 103(a) (2011) as being unpatentable over Bell (Final Rej'n 5); or the rejection of claims 1-8 under § 103(a) as being unpatentable over Bell and either Rennco or Hosso (Final Rej'n 6 and 9).[2]

The claims on appeal relate to cutter-sealers for cutting and sealing sheets of polymers such as polyethylene and polyolefins commonly used in products such as bubble films, bread bags and freezer bags. ('473 patent, col. 1, ll. 20-23, and col. 2, ll. 31-36). Claims 1 and 8 are independent. Claim 1 recites:

> 1. A cutter-sealer for cutting and sealing layers of film, said cutter-sealer comprising:

[2] In the Final Rejection, the Examiner withdrew prior rejections of claims 1-4 under § 103(a) as being unpatentable over Rennco and Bell; Rennco and Hosso; Hosso and Williams; Hosso, Williams and Shanklin; Hosso and McLean (US 4,317,697, issued Mar. 2, 1982); and Hosso and Rennco. (Final Rej'n 18-20). The Examiner also withdrew prior rejections of claim 4 under § 103(a) as being unpatentable over Williams, Hosso and Shanklin; and Williams, Rennco, Shanklin and Bell. (Final Rej'n 20).

a blade for being selectively heated and for cutting and sealing the layers of film, said blade having:

a cutting section with a distal portion defining a cutting edge, said cutting edge being adapted to transfer heat from said blade to the layers of film sufficient to soften a portion of the layers of film along said cutting edge without liquifying the layers of film; and

at least one first blade shoulder fixed proximate said cutting section rearward of said cutting section, said at least one first blade shoulder being adapted to transfer heat to the layers of film; and

a second blade shoulder fixed proximate said cutting section and oppositely disposed to said first blade shoulder;

wherein said blade defines a heater receptacle adapted for receiving a heating element;

a seal pad fabricated of a flexible material, said seal pad defining a seal pad slot for receiving at least a portion of said cutting section of said blade, said seal pad further defining at least a first contact surface proximate said seal pad slot adapted to cooperate with said at least one first blade shoulder to engage the layers of film and press the layers of film together, said seal pad further defining a second contact surface proximate said seal pad slot;

> a seal pad caddy for carrying said seal pad, wherein said seal pad caddy defines at least a first material fixation surface; and
>
> a means for selectively securing the layers of film proximate said seal pad slot, wherein said means for securing the layers of film proximate said seal pad slot includes at least one film clamp adapted to cooperate with said first material fixation surface to engage the layers of film and hold the layers of film tautly across said seal pad slot;
>
> whereby after said cutting edge contacts the layers of film to heat and soften the layers of film without liquefying the layers of film, at least a portion of said cutting section of said blade travels through the layers of film and into said seal pad slot, thereby dividing the layers of film and allowing said at least one first blade shoulder to press the layers of divided film against said at least one first contact surface to accomplish sealing of the layers of divided film and whereby at least a portion of the layers of divided film are pressed between said second blade shoulder and said second contact surface to accomplish the sealing of the layers of film.

(App. Br. PO 38 (Claims App'x)). Claim 8 also recites the limitation "whereby after said cutting edge contacts the layers of film to heat and soften the layers of film without liquefying the layers of film, at least a portion of said cutting section of said blade travels through the layers of film and into said seal pad slot."

The Examiner's findings and conclusions are set forth in the Final Rejection and in an Examiner's Answer ("Ans.") mailed May 3, 2013. The Patent Owner's arguments are set forth in an Appeal Brief ("App. Br.")

dated March 18, 2013 and a Reply Brief ("Reply Br.") dated July 3, 2013. In addition, the Patent Owner relies on Declarations of Dr. Jamil A. Khan dated April 14, 2012 ("Khan Decl.") and October 17, 2012 ("Second Khan Decl."); and a Declaration of Sam Scott dated April 6, 2012 ("Scott Decl.").

The Patent Owner has not identified any other post-grant proceeding involving the '473 patent. The Patent Owner does state that '473 patent is at issue in a case pending before the U.S. District Court for the District of South Carolina, *NAS Nalle Automation Sys. LLC v. DJS Sys. Inc.*, Case No. 6:10 CV 2462 (Cain, J.). The Patent Owner reports that the litigation is stayed pending this reexamination proceeding. (App. Br. 3).

ISSUES

Only issues and findings of fact contested by the Patent Owner in this appeal have been considered. *See* 37 C.F.R. § 41.67(c)(1)(vii) (2011). Two issues are dispositive of the appeal:

> *First*, has the Examiner persuasively shown that Bell describes or teaches a cutter sealer including a blade having a cutting section with a cutting edge "whereby after said cutting edge contacts the layers of film to heat and soften the layers of film without liquefying the layers of film, at least a portion of said cutting section of said blade travels through the layers of film and into said seal pad slot?"
>
> *Second*, has the Examiner persuasively shown that the subject matter of claims 1 and 8 would have been obvious from the combined teachings of Williams, Shanklin and either Rennco or Hosso?

FINDINGS OF FACT

The record supports the following findings of fact ("FF") by a preponderance of the evidence.

Shanklin

1. In its "Background of the Invention" section, Shanklin teaches that known hot knife sealing systems used a hot knife blade to cut layers of polymer film and simultaneously seal the edges of the layers together. (Shanklin, col. 1, ll. 38-41). Shanklin also teaches that, "when using the temperature required to make a clean cut, some types of polyethylene film soften to a point where the molten film will gum up between the knife and the sealing surfaces requiring frequent maintenance and cleaning." (Shanklin, col. 1, ll. 48-52).

2. Shanklin describes a sealing jaw assembly (that is, a blade) including a pair of jaws *11* and *12*. The sealing jaw assembly also includes a serrated knife *14* retractable into the space between the jaws *11*, *12*. (Shanklin, col. 2, ll. 67-68; col. 3, ll. 2-9; and figs. 3 and 5). Shanklin describes using the sealing jaw assembly to cut layers of film overlying a slotted, elastomeric bed *50*. (Shanklin, col. 4, ll. 51-55). Shanklin teaches that the knife *14* "extends into the slot **52** in the elastic bed **50** forcing its way through the film which is securely clamped between the seal jaws **11** and **12** and the elastomeric bed **50**." (Shanklin, col. 3, ll. 55-58).

3. The Examiner correctly finds that Shanklin solved the problem of polymer residue building up on the blades of hot knives which cut by locally heating the layers of film to their melting temperatures. (*See* Ans. 69-72). As Shanklin teaches:

> Because the cut is made mechanically in the present invention, rather than by softening the film, the cut can be made at a temperature that is appreciably lower than that which is required for severing with one of the prior art systems. Typically, when used with heated mating beds, the jaw sealing and severing system of [Shanklin] can operate with sealing jaw temperatures of 270°F. to 280°F. on a polyethylene film that would require temperatures of 300°F. to 350°F. to operate with prior art jaw systems. Since polyethylene becomes quite molten in the 300°F. to 350°F. range, it can be readily seen that gumming and build-up can occur with prior art jaws, whereas it does not occur with [Shanklin's] jaws.

(Shanklin, col. 3, l. 65 – col. 4, l. 10).

Williams

4. The Examiner correctly finds that:

> Williams teaches a cutter sealer, see abstract [*see also* Williams, col. 2, ll. 47-51 and 56-57], comprising a blade 14 having a cutting section defining a cutting edge 16[,] and first and second blade shoulders 18, 20. Williams teaches a heater unit 26 within a receptacle within the blade 14. A seal pad 40, 44 is made of resilient material [()"[t]he pad 40 is in the form of conventional rubberlike or felt yieldable material", column 3, lines 21-23[])]. The seal pad can include a slot as shown in the embodiment of figures 3A, 3B and seal pad 44. A seal pad caddy 42 is shown in the drawings [e.g., figs. 3A, 3B]. The seal pad 44 includes first and second contact surfaces where the shoulders 18, 20 contact the seal pad 44. There are means 22 and 24 for selectively securing the

> layers of film proximate the seal pad slot in the form of film clamps.

(Ans. 16-17; *see also id.* at 47).

5. Williams discloses that the cutting and sealing unit *14* "has a cutting blade **16** held between a pair of heater bars **18**, **20**." (Williams, col. 2, ll. 56-57). As depicted in Figures 3A and 3B of Williams, the heater bars *18*, *20* define shoulders for contacting the seal pad *44*. (*See* Ans. 47). The cutting blade *16* may be fixed by means of screws *30* in either a retracted position, in which the blade extends approximately 0.013 inch (0.3 mm) to 0.016 inch (0.4 mm) from the heater bars *18*, *20*; or an extended position, in which the blade extends approximately 0.06 inch (1.5 mm) to 0.07 inch (1.8 mm) from the heater bars. (Williams, col. 3, ll. 8-19, 54-58). Figure 3B of Williams depicts the blade *16* in the extended position as travelling through the layers of film and into the seal pad slot.

6. Williams teaches that "[e]ach time the unit **14** operates it flattens and clamps the tubular film and applies heat to fuse the flattened film ends together on both sides of the cut." (Williams, col. 2, ll. 51-54). This teaching of applying heat to fuse the film ends implies Williams' unit *14* heats the portion of the film near the blade *16* above the melting point. (Second Khan Decl., para. 8). This teaching does not imply that one of ordinary skill in the art could not modify William's unit *14* to implement Shanklin's teaching to cut layers of film mechanically (that is, by shearing under stress) at temperatures below melting or fusing temperatures.

7. The Patent Owner's expert, Dr. Jamil A. Khan ("Khan") declares that the length of the blade *16* as described in Williams is not sufficient to cut layers of film by shear via pass through cutting at a local

temperature below the melting point of the film material. Khan instead declares that Williams' blade "will cut either by melting or *by pressing the sheet between the blade tip and the seal pad surface and shearing under stress*." (Khan Decl., para. 17 (italics added for emphasis))

8. The Examiner reasons that "[p]erhaps there is a different type of polymer having a different thickness with a specific density, etc., in which the Williams device can cut and seal the film without liquefying the film" when the device is heated to a suitable temperature below the melting point. (Ans. 48). The Examiner's finding is more persuasive than Khan's opinion testimony. Common sense implies that Williams' blade, even if too short to cut some films layers, could cut other, thinner film layers. Furthermore, Williams' blade *16* as depicted in Figure 3A cuts layers of film stretched across a seal pad slot. (Williams, col. 3, ll. 58-63 and figs. 3A and 3B). It is reasonable to infer that blade *16* is capable of shearing via a pass through cut, a suitably thin film having suitable physical properties even when the portions of the layers of film near the blade are heated below that material's melting point.

9. Khan reports performing an experiment to determine whether or not the cutter sealer described by Williams was capable of cutting layers of film without liquefying the film material near the cut. (Second Khan Decl., para. 9). Khan reports that:

> To carry out the experiment, a Williams device was recreated according to the specifications, dimensions, descriptions, and figures contained in the Williams patent, using sound engineering judgment. A series of springs were provided on the clamping plates to hold the film against the action of the blade, as specified in the Williams

> patent. . . . In our design of the experiment, we chose a blade projection of 0.063 inches. We had two pads, a rubber pad and a felt pad both having slots to receive the blade. Cutter and sealer temperatures were controlled by a temperature controller[;] additionally, the blade temperature was physically measured, before each operation, using a calibrated Fluke 52 II, thermocouple. Experimental cut/seal operations were performed at . . . 209°F, 220°F, 235°F, 255°F, 262°F, 273°F, 293 °F, 330°F, 352°F, and 400°F. The measured temperatures of the blade were accurate to within ±3°F (the uncertainty due to the nature of the temperature controller and the measuring device).

(*Id.*)

10. Khan further declares that, "[f]or cutting and joining, we used two layers of one and half mil [0.038 mm] commercial grade polyurethane film." (Second Khan Decl., para. 9). The Examiner finds that Khan's reference to polyurethane was a typographical error and that Khan instead used two layers of 1½ mil *polyethylene* film. (Ans. 48). The Patent Owner does not contest the Examiner's correction. (*See, e.g.*, Reply Br. 9 ("In an attempt to dispute the findings of Dr. Khan, the Examiner criticizes the experiment conducted by Dr. Khan as being incomplete, since the experiment used a commercial grade of polymer film – i.e., polyethylene – and did not use every different type of polymer film conceivable.")).

11. From these tests performed on the single thickness of polyethylene film, Khan extrapolates that "when the temperature of the Williams blade was reduced below the melting point of the film, the Williams device did not function to cut the film, rendering Williams inoperable for cutting and leading to a weak seal." (Second Khan Decl.,

para. 9). Khan infers that "a blade length of 0.06 to 0.07 inches as specified by Williams is not sufficient to complete the cut below the melting point." (*Id.*)

12. The Examiner finds a number of problems with these tests on page 48 of the Answer. For example, Khan provides no details as to the reconstruction of Williams' cutting and sealing unit other than the length of the blade, the material of the seal pad and the blade temperatures used. Without such details, one is left to speculate as to whether the unit in general, and the heater bars and clamping plates in particular, accurately reproduce Williams' description. The photographs in the Appendix to the Second Khan Declaration do not remedy the deficiency in Khan's description of the tests.

13. Furthermore, Williams does not identify the type of polymer, grade or thickness of the layers of film to be cut and sealed by Williams' cutting and sealing unit. (Ans. 48). Khan only tested the ability of the reproduction of Williams' unit to cut and seal layers of one thickness of one type and grade of film, namely, two layers of 1½ mil commercial grade polyethylene film. As the Examiner correctly finds, Khan's tests do not support the inference that Williams' unit cannot cut layers of *any* type or thickness of film at a temperature below the melting point of the film material. (*See id.*)

14. The Examiner also correctly finds that Khan fails to specify the cutting force with which the reproduction of Williams' unit pressed the blade against the layers of film. (*See* Ans. 48). Likewise, Khan fails to specify the tautness with which the layers of film are stretched over the seal pad slot by the clamping plates. Without knowing the cutting force applied

to the test film layers and the tautness with which the layers of film were held, one cannot infer that Williams' unit could not cut layers of film of suitable material and thickness at temperatures below the melting points of the materials.

15. The Examiner has established that one of ordinary skill in the art could have modified Williams' cutting and sealing unit *14* "to heat the blade to a point where good seals are made at a considerably lower temperature than the melting point of the film as taught by Shanklin to prevent the film from melting and gumming up the blade and seal pad."

Rennco

16. Rennco describes a TRIBAR PT seal assembly designed for cutting and sealing low density films as well as a TRIBER SCS seal assembly for cutting and sealing high density films. (Rennco 10). The Examiner correctly finds that Rennco's drawings depict a seal pad caddy having "material fixation surfaces adjacent the seal pad slot for film clamps to hold the layers to hold the layers of film tautly over the seal pad slot. The engagement of the film clamps with the material fixation surfaces in Rennco is an abutting relationship." (Ans. 10; *see also id.* 11 (including a marked-up drawing annotating elements recited in claims 1 and 8 onto the TRIBAR PT seal assembly)).

Hosso

17. Hosso describes a hand operated bag sealer. (Hosso, col. 1, ll. 7-11). The Examiner correctly finds that Hosso's bag sealer includes "a pair of fixed arms 84 that pass over the outer sides of the seal pad caddy 28

pulling the plastic film down to either side of the seal pad caddy 28 pulling the film taut over the seal pad slot." (Ans. 20; col. 3, ll. 54-64; Fig. 5).

Secondary Considerations—Long Felt But Unmet Need

18. Khan states that:

> There has been a long felt need in the area of cutter-sealers to arrive at a solution to minimize residue buildup on the blades, prevent material from being forced into a cutting slot, prevent film from sticking to the blade and slot, minimize downtime for maintenance and sharpening, maintain ventilation for smoke and fumes, and provide proper balance between sealing pressure and cutting pressure simultaneously.

(Khan Dec., para. 5; Second Khan Decl., para. 5).

19. Khan cites no evidence in support of this statement other than the teachings of Shanklin. (*See, e.g.*, Khan Decl., para. 18).

20. Shanklin acknowledged a problem with residue buildup on blades as early as March 6, 1991. (FF 1; *see also* Khan Decl., para. 18). The Examiner correctly finds that Shanklin also solved this problem. (FF 3).

21. Khan declares that Shanklin failed to solve the problem of residue buildup on the blade. More specifically, Khan states that, in the embodiment described by Shanklin, the serrated blade would have created a high potential for accidental worker injury. Khan also states that the sealing jaw assembly in Shanklin's embodiment would have required significant maintenance to keep the cutting blade sharp, properly aligned with the seal pad and free of impediments. (Second Khan Decl., para. 6). Despite these drawbacks, Shanklin taught the solution to the problem of polymer buildup

disclosed in the Specification of the '473 patent, namely, cutting layers of film at an elevated temperature below the melting point of the film material. (*Compare* '473 patent, col. 2, ll. 31-36 and 51-62 *with* Shanklin, col. 1, ll. 48-52 and col. 3, l. 65 – col. 4, l. 10). Since Shanklin taught the solution to the problem of polymer buildup on the blade, the asserted long felt need is entitled to little weight as objective evidence of non-obviousness.

Secondary Considerations—Commercial Success

22. The Patent Owner's declarant, Sam Scott ("Scott"), declares that "[b]y 2012, based on my knowledge of revenue attributable to the '473 patent, the increase in revenue attributable to retrofits of competitors' equipment using the '473 patented technology amounted to over $3.3M in revenue." (Scott Decl., para. 4). Scott does not provide a source for this statement or any evidence to support it. Even assuming the statement to be true, it does not provide any context to indicate how significant $ 3.3M worth of retrofits may have been in terms of the overall number of competitors' machines available for retrofit. Moreover, the Examiner correctly finds that Scott fails to provide any evidence to show that any commercial success was due to any unique characteristic of the claimed subject matter. (*See* Ans. 69). As a consequence, because the statement does not establish adequate nexus between the claimed subject matter and the asserted commercial success, it is of questionable probative value in establishing non-obviousness.

Secondary Considerations—Testimonial from Gen-Pak LLC

23. The Scott Declaration includes a document self-identified as a letter dated April 10, 2012 from Bruce E. Evans, a Plant Manager of the North Carolina facilities of Genpak LLC (Genpak"). Scott declares that "Genpak is an industry leader in the field of manufacturing quality food packaging." (Scott Decl., para. 4). The document states that Genpak started running several machine including Rennco seal bars in the mid-1990's. The document additionally states that Genpak experienced trouble with the seal bars due to daily cleaning requirements as well as inconsistent seals on finished goods. (Scott Decl., Attachment A).

24. The document states that:

> Around 2005 Genpak was introduced to NAS at a Chicago NPE event and was immediately impressed with their very exclusive seal bar design which offered a unique difference: proximity of heater to actual seal area. But it was not just the location but the design as well that enhanced this unique seal bar technology. With the seal blade design and the heater proximity it was making perfect seals and cuts at a temperature setting of 215 F vs. 380 F for the Rennco Tribar. The NAS seal bar was giving what we expected Tribar performance to be along with the added benefits of much lower temps, all-in-one bar and only one heater. We asked NAS to retrofit one of our machines in 2006 and we literally never had buildup or any maintenance issues on our first trial for over a year. Since then we have retrofitted all machines at the Charlotte Plant and Genpak has also implemented NAS's retrofits at several other plants within the Genpak organization.

(Scott Decl., Attachment A).

25. This document is entitled to little weight as objective evidence that the subject matter of claims 1 and 8 would not have been obvious from the teachings of Williams, Shanklin and either Rennco or Hosso. First, the individual identified as the author of the document, Bruce E. Evans, has not executed an affidavit or declaration attesting to the truth of what the document says. Second, the document compares the performance of the seal bars of cutter-sealers allegedly embodying the subject matter of claim 1 or claim 8 with the seal bars described by Rennco rather than with structure described by one of the two closest references, Williams and Shanklin. Third, the document describes several reasons why the NAS seal bars allegedly were superior to Rennco's, including "proximity of heater to actual seal area," "all-in-one bar and only one heater." As the Examiner correctly finds, the document does not indicate that the alleged superiority of the NAS seal bars was due to the claimed subject matter. (*See* Ans. 68-69; Final Rej'n 35).

Bell

26. Bell describes a "low thermal inertia" die *10* and an anvil *80* for cutting and sealing plastic packaging materials. (Bell, col. 1, ll. 6-8; col. 3, l. 66 – col. 4, l. 1; col. 4, ll. 31-32; and fig. 2A and 2B). Bell's "low thermal inertia" die *10* includes a working face *12*. The working face includes a central ridge *16*. (Bell, col. 3, l. 66 – col. 4, l. 2 and fig. 1). The die *10* includes an embedded electric heater assembly *22*. (Bell, col. 4, ll. 4-8). Bell's anvil *80* includes a U-channel member *82* mounting a profiled member *86* composed of a flexible, elastomeric material. The upper surface of the profiled member *86* includes raised sections *90* on either side of the

center line of the anvil *80*. The profiled member *86* carries a fiber glass strip insert *88*. (Bell, col. 4, ll. 36-42 and fig. 2A). Figure 2A of Bell depicts the fiber glass strip insert *88* as spanning a space or slot defined between the raised sections *90*.

27. Bell describes the use of the "low thermal inertia" die *10* and an anvil *80* for cutting and sealing sheets of plastic material. After describing the clamping of the sheets of plastic material against the anvil *80* (Bell, col. 4, ll. 43-53), Bell states that:

> In time the die **10** bears upon the fiber glass insert **88** and will cause the plastics sheets to be fused and, if the anvil **80** and the working face **12** are appropriately shaped (e.g., by having central ridge **16**), to cut along the center line of the anvil [**80**].

(Bell, col. 4, ll. 53-57).

28. Regarding the recitation of claim 1 and 8 "whereby after said cutting edge contacts the layers of film to heat and soften the layers of film without liquefying the layers of film, at least a portion of said cutting section of said blade travels through the layers of film and into said seal pad slot," the Examiner finds that:

> This language is merely describing the sequence of events of how the cutting edge contacts the layers of film and travels through the film and into the seal pad slot. This step would happen in Bell. Even though Bell teaches that the central ridge 16 contacts the anvil 80 to cut the film, Bell's blade can also perform the same sequence of events if Bell's blade is heated to a temperature high enough to soften the film to a point where the cutting edge 16 cuts the film before it contacts the insert 88. The film is stretched tautly across the slot by clamps 56. Once the heated cutting edge 16

> contacts the taut film, the heat and the sharp edge of the cutting edge can travel through the layers of film dividing the film then the cutting edge would travel into the slot.

(Ans. 7).

29. This reasoning is dependent on the Examiner's finding that

> As the heated cutting edge 16 of Bell moves downward and contacts and applies force to the taut layers of film, the heated cutting edge can cut the film before it hits the insert 88 in the middle of the slot depending upon the type of material used, the thickness of the material, the temperature of the cutting edge, length of time in contact with the film etc.

(Ans. 25; *see also id.* 28). Even assuming for purposes of this appeal that Bell's blade *10* is capable of cutting a film without liquefying the film along the cut, the Examiner has not justified a finding that the blade could cut the film *before* the blade reached the insert *88* and was blocked from travelling further into the slot.

30. The Examiner has not shown that Bell describes a cutter-sealer satisfying the limitation "whereby after said cutting edge contacts the layers of film to heat and soften the layers of film without liquefying the layers of film, at least a portion of said cutting section of said blade travels through the layers of film and into said seal pad slot." In other words, Bell does not anticipate claims 1-6 and 8.

ANALYSIS

First Issue

Claim 1 recites the limitation "whereby after said cutting edge contacts the layers of film to heat and soften the layers of film without liquefying the layers of film, at least a portion of said cutting section of said blade travels through the layers of film and into said seal pad slot." The Examiner concludes that this "'whereby' clause does not further structurally define the invention" but instead "recite[s] functional intended use language." (Ans. 7). The Examiner also concludes that the "whereby" clause "is merely describing the sequence of events of how the cutting edge contacts the layers of film and travels through the film and into the seal pad slot." (*Id.*)

Although the "whereby" clause at issue is functional in nature, it serves to limit the scope of claim 1. As a general rule, functional recitations which limit the structure of a claimed apparatus must be considered in addressing whether the apparatus would have been obvious. *See Pac-Tec Inc. v. Amerace Corp.*, 903 F.2d 796, 801 (Fed. Cir. 1990)(citing *In re Venezia*, 530 F.2d 956 (CCPA 1976)). Here, the functional language does not merely recite an intended use for the claimed cutter-sealer. Instead, the "whereby" clause defines characteristics of the elements of the claimed cutter-sealer, or the manner in which those elements are interconnected, in terms of how the elements contribute to the operation of the cutter-sealer as a whole. *See Venezia* at 958-59. In doing so, the clause excludes cutter-sealers in which the elements are not constructed and arranged to satisfy the limitation.

The Examiner has not provided adequate evidence or technical reasoning to justify finding that Bell describes a blade which is even capable of performing the recited function. (FF 27, 29 and 30). The Examiner does not cite either Rennco nor Hosso for a teaching which might remedy this deficiency for purposes of the rejections under § 103(a). (*See* Ans. 17 and 20; FF 16 and 17). We do not sustain the rejection of claims 1-6 and 8 under § 102(b) as being anticipated by Bell; the rejection of claim 7 under § 103(a) as being unpatentable over Bell; or the rejection of claims 1-8 under § 103(a) as being unpatentable over Bell and either Rennco or Hosso.

Second Issue

The Examiner finds that Williams fails to describe a cutter sealer including "a cutting edge, said cutting edge being adapted to transfer heat from said blade to the layers of film sufficient to soften a portion of the layers of film along said cutting edge without liquefying [*sic*] the layers of film." (*See* FF 4). Shanklin expressly teaches the use of a cutting edge "adapted to transfer heat from said blade to the layers of film sufficient to soften a portion of the layers of film along said cutting edge without liquifying the layers of film" as a solution to the problem of polymer buildup on the blade. (FF 1 and 3). The Examiner correctly concludes that it would have been obvious to modify Williams' cutter sealer "to heat the blade to a point where good seals are made at a considerably lower temperature than the melting point of the film as taught by Shanklin to prevent the film from melting and gumming up the blade and seal pad." (Ans. 18 and 21).

The Patent Owner argues that the level of ordinary skill in the art would not have sufficed to implement the modification proposed by the

Examiner; and that the attempt to implement the modification would have rendered Williams' unit inoperable for the purpose of cutting layers of plastic film. (*See* App. Br. 29 and 33; Reply Br. 6-7). We find that one of ordinary skill in the art could have modified Williams' cutting and sealing unit *14* "to heat the blade to a point where good seals are made at a considerably lower temperature than the melting point of the film as taught by Shanklin to prevent the film from melting and gumming up the blade and seal pad" while maintaining the function of cutting layers of plastic film. (FF 7-15).

The Examiner also finds that Williams fails to describe "at least one film clamp adapted to cooperate with [a] first material fixation surface" defined by the seal pad caddy; but that either Rennco or Hosso teaches this limitation. (*See* Ans. 17 and 20). The Examiner also finds that "[i]t would be immaterial if the film clamps hold fast the layers of film adjacent the sealing pad slot or further away on the frame of the seal pad caddy." (Final Rej'n 12). As support for this finding, the Examiner reasons that, "[w]hile there may be slight differences between the tensile forces at the two different locations, this does not change the overall [effect] to 'hold the layers of film tautly across said seal pad' as claimed." (Ans. 72).

The Patent Owner argues that:

> Khan has declared that the locations of the film clamps relative to the seal pad slot are important to hold fast the layers of film tautly across the seal pad slot, due to the tensile stress-strain curve for polymeric material and the distance of the clamps away from the blade is important to the tautness of the film. See [Khan Decl.] at ¶ 10. Accordingly,

> the Examiner's allegation has been fully addressed and overcome.

(App. Br. 31-32).

The Examiner's reasoning is more persuasive. The difference in tautness provided by Williams' clamping pads *22*, *24* as described and the clamping pads as modified to press the film against material fixation surfaces defined on the seal pad caddy likely would not be so large as to have discouraged one of ordinary skill in the art from carrying out the proposed modification.

The evidence cited by the Examiner as providing a factual underpinning for the conclusion that the subject matter of claims 1 and 8 would have been obvious is more persuasive than the objective evidence of nonobviousness offered by the Patent Owner. The Patent Owner has not established either that the claimed subject matter has been commercially successful or that the subject matter has satisfied a long felt but unmet need in the art. (*See* FF 18-22). The Patent Owner has not provided a persuasive explanation how Attachment A of the Scott Declaration might be pertinent to the patentability of claims 1 and 8. In any event, Attachment A is entitled to little weight as objective evidence of non-obviousness. (FF 23-25). Since the Examiner has provided persuasive reasoning with some rational underpinnings to support the conclusion that the subject matter of claims 1 and 8 would have been obvious, we sustain the rejection of claims 1-3 and 5-8 under § 103(a) (2011) as being unpatentable over Williams; either Rennco or Hosso; and Shanklin.

DECISION

We AFFIRM the Examiner's decision rejecting claims 1-3 and 5-8.

We REVERSE the Examiner's decision rejecting claim 4.

Requests for extensions of time in this reexamination proceeding are governed by 37 C.F.R. § 1.550 (2011).

AFFIRMED-IN-PART

Appeal 2013-009041
Reexamination Control 90/011,957
Patent No. US 7,631,473 B2

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US007631473B2

(12) **United States Patent**
Nalle, III

(10) **Patent No.: US 7,631,473 B2**
(45) **Date of Patent: Dec. 15, 2009**

(54) **CUTTER-SEALER FOR CUTTING AND SEALING POLYMER SHEETS**

(76) Inventor: **Thomas A. Nalle, III**, 1621 Bingham Dr., Knoxville, TN (US) 37922

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 65 days.

(21) Appl. No.: **12/019,040**

(22) Filed: **Jan. 24, 2008**

(65) **Prior Publication Data**

US 2008/0115638 A1 May 22, 2008

Related U.S. Application Data

(63) Continuation-in-part of application No. 10/945,771, filed on Sep. 21, 2004, now abandoned.

(51) **Int. Cl.**
B65B 51/14 (2006.01)
B26D 7/10 (2006.01)
B31B 1/64 (2006.01)

(52) **U.S. Cl.** **53/373.7**; 53/374.8; 83/171; 156/515; 493/203; 493/209

(58) **Field of Classification Search** 53/477, 53/479, 552, 370.7, 371.2, 371.8, 373.7, 53/374.2, 374.8, 375.9; 83/16, 171; 156/251, 156/515; 219/243; 493/203, 209
See application file for complete search history.

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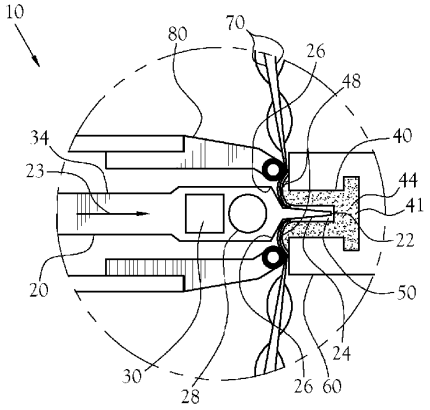
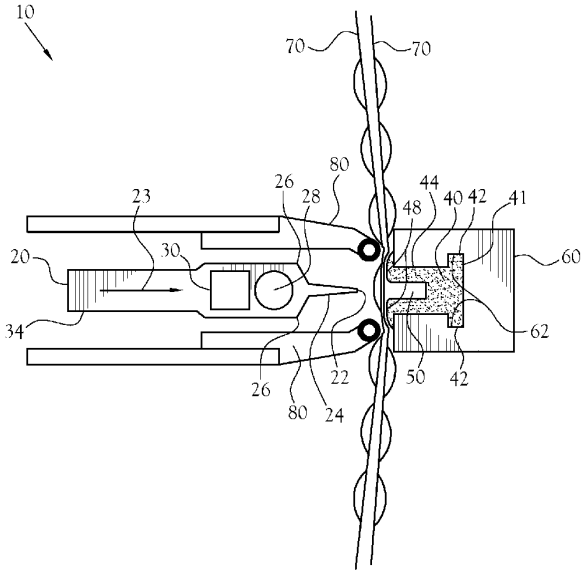
(57) **ABSTRACT**

A cutter-sealer (**10**) and a method (**300**) for cutting and sealing layers of film (**70**) together. The cutter-sealer (**10**) provides a heated blade (**20**), part of which moves through sheets of tautly held layers of film (**70**) into a slot defined by the seal pad (**40**). The blade's (**20**) motion is arrested by a set of blade shoulders (**26**) that press against the layers of film (**70**) for a period of time, thereby sealing the layers of film (**70**) together. The method (**300**) includes cutting layers of film (**70**) without liquefaction and sealing the newly cut edges of the layers of film (**70**) together, also without liquefaction of the layers of film (**70**).

4 Claims, 4 Drawing Sheets





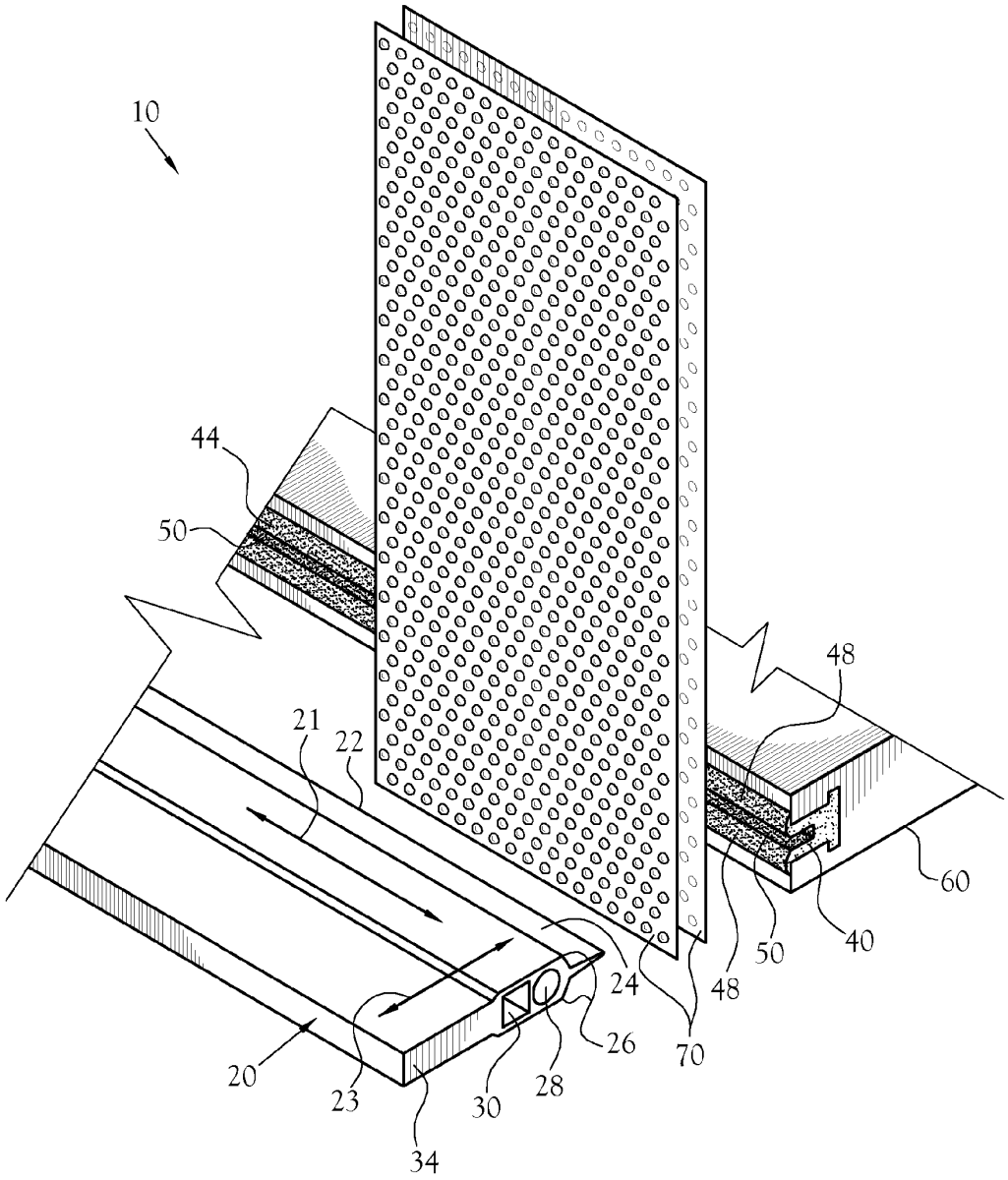


Fig. 1

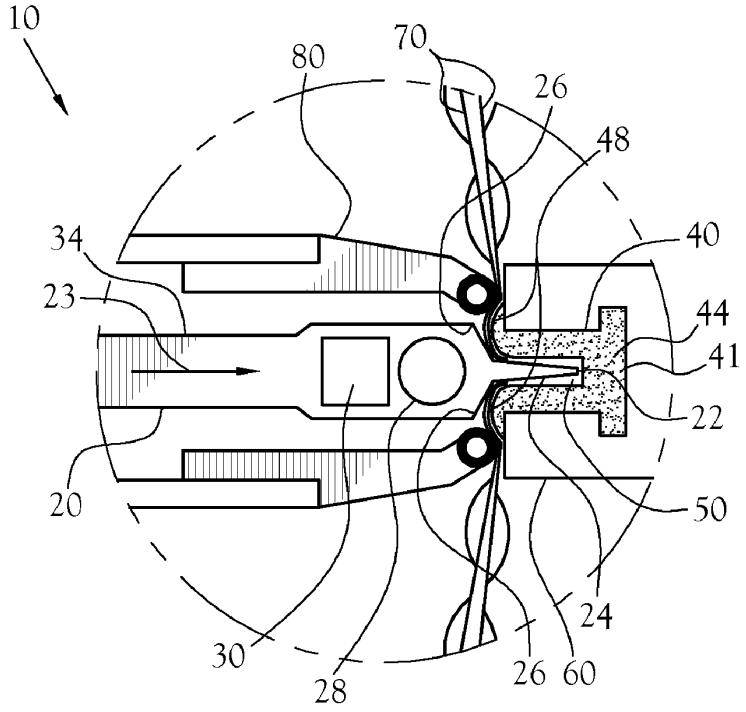


Fig.2

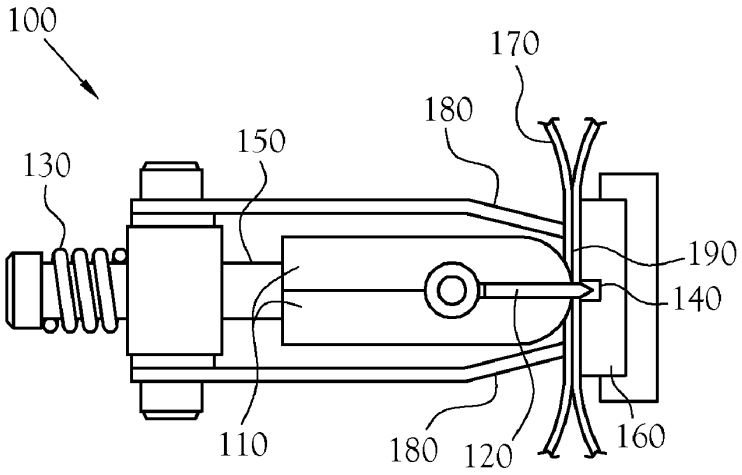


Fig.3
(PRIOR ART)

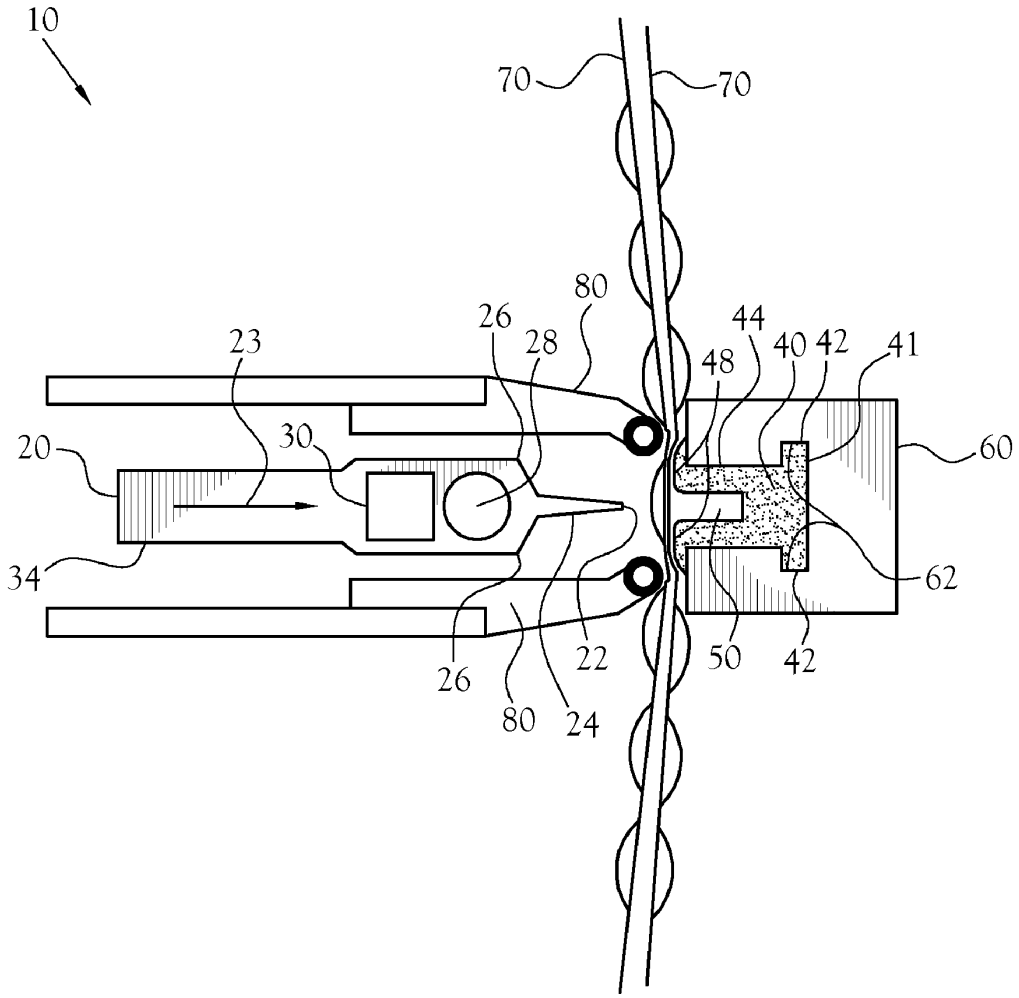


Fig.4

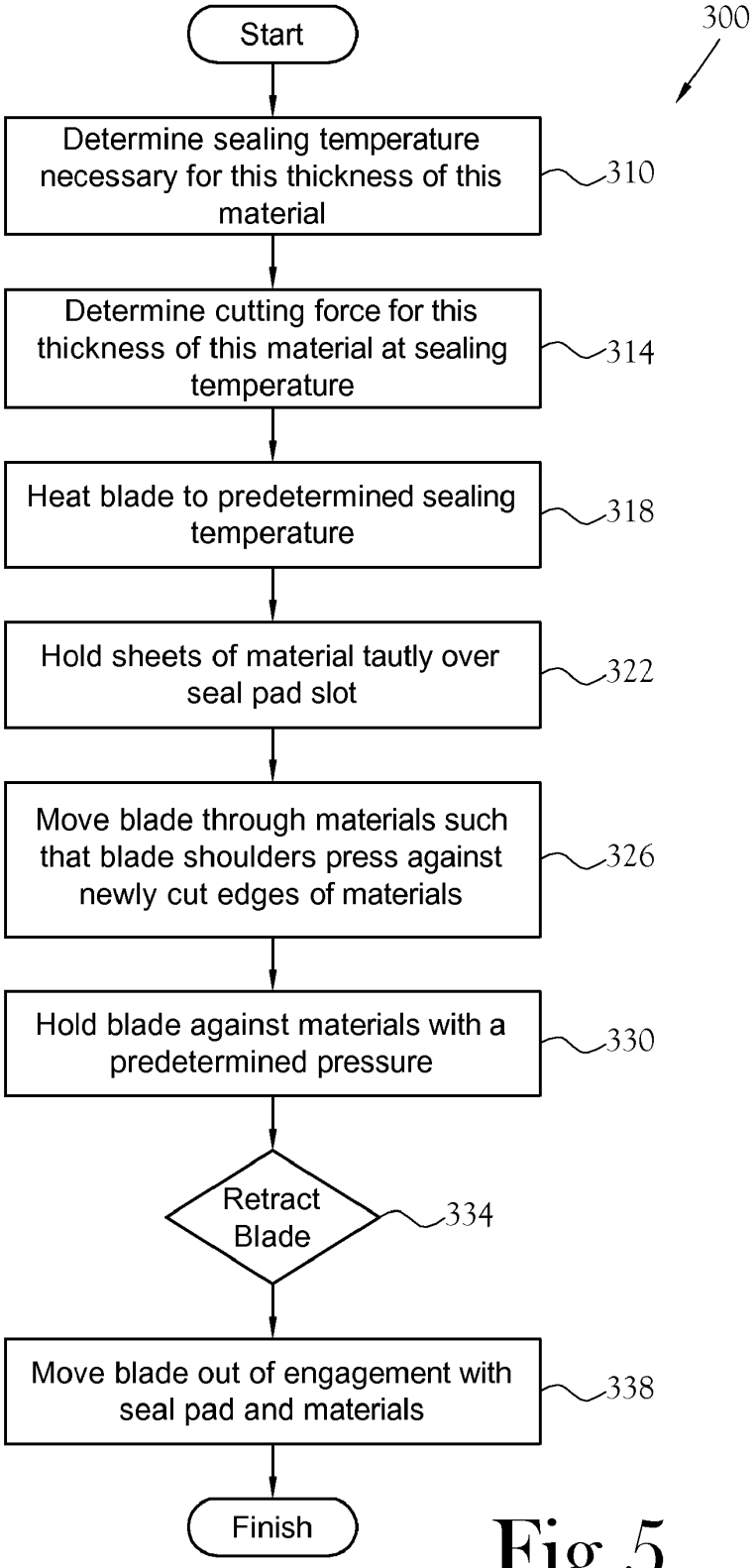

300
Start
Determine sealing temperature necessary for this thickness of this material
310
Determine cutting force for this thickness of this material at sealing temperature
314
Heat blade to predetermined sealing temperature
318
Hold sheets of material tautly over seal pad slot
322
Move blade through materials such that blade shoulders press against newly cut edges of materials
326
Hold blade against materials with a predetermined pressure
330
Retract Blade
334
Move blade out of engagement with seal pad and materials
338
Finish

Fig.5

CUTTER-SEALER FOR CUTTING AND SEALING POLYMER SHEETS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation-in-part of U.S. patent application Ser. No. 10/945,771, filed Sep. 21, 2004, now abandoned.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not Applicable

BACKGROUND OF THE INVENTION

1. Field of Invention

The present invention relates to the field of cutting and sealing sheets of polymers. More particularly, this invention relates to cutting and sealing sheets of polymers such as the polyethylenes and polyolefins commonly used in products such as bubble film, bread bags and freezer bags.

2. Description of the Related Art

Cutter-sealers that use heat to cut and form a seal between the edges of sheets of polymer are well known in the art. Typically, a heated blade is brought to bear on two sheets of a polymer supported by a rubber seal pad. The heated blade melts the polymer and divides it in two to push liquefied polymer to each side of the blade. The liquefied polymer pushed to each side of the blade seals the edges of the newly divided polymer together. Thus the typical polymer cutter-sealer uses heat to melt the polymer so as to both divide and seal in a single operation.

The use of melting heat to both cut and seal is possible because of the unique properties of polymers, which are simply substances whose molecules have high molar masses and are composed of a large number of repeating units. Polymers are generally formed by chemical reactions in which a large number of molecules called monomers are joined sequentially, forming a chain. Plastic is the most common example of a polymer. A polymer's reaction to heat is determined by the molecules used as monomers and the structure of the chain. Polyethylenes, for example, are a subset of polymers in which the chains are formed by a double bond between carbon atoms. Polyethylenes are commonly used for padded packaging such as bubble film, which is made from sheets of materials that are sealed together to form a single layer of packaging having an array of air bubbles formed between the layers. Such bubble film is often cut to a desired length and sealed together to form the closed end of a container in an operation similar to that described above.

Obviously, the speed and quality with which polymer film containers can be produced is a significant factor in a competitive marketplace. Hence, several machines and techniques have been developed that focus on this particular aspect of the manufacturing process. Many of these, including the device disclosed in U.S. Pat. No. 5,056,295, issued to Williams, use heat to melt the polymer in order to both divide and seal. However, the use of melting heat simultaneously for both dividing and sealing operations forces conventional cutter-sealer blades to be heated to temperatures well above the melting point of the polymer film so that the necessary liquefaction occurs. The liquefaction of polymers, however, creates residue on the blade, which can stop production for removal of the residue or cause incomplete cuts and faulty seals if left unchecked. The high temperatures that are necessary also make it difficult for human operators to interact with the process.

The blade design dictated by the use of melting heat to cut and seal layers of polymer film often produces a thin or impartial seal. For example, in several designs, only the material pushed to the sides of the blade creates the seal. In such designs, the conventional blade may not push equal amounts of material to both sides, creating a thinner seal than normal on one side and more residue that normal on the other.

In other designs, such as U.S. Pat. No. 5,131,213, issued to Shanklin et al., a heating apparatus contacts a portion of the polymer layers, applying heat to the layers in order to seal a portion of the layers. Thereafter, a blade contacts the sealed layers to cut the sealed portion of the layers. In such designs, again the problem arises of exposing the cutting blade to a section of heated layers. In such designs, the initial heating of multiple polymer film layers followed by cutting of the heated layers often results in excessive buildup of melted polymer residue on the cutting blade, which can stop production for removal of the residue or cause incomplete cuts and faulty seals if left unchecked. In the case of sealing and cutting bubble film, such initial heating of multiple layers of bubble film can also result in overheating and explosive rupturing of the portion of the bubble array to be sealed and cut, thereby resulting in irregular and partial sealing of the bubble film layers.

BRIEF SUMMARY OF THE INVENTION

The present invention provides a cutter-sealer allowing for reduced or eliminated polymer buildup within the cutter-sealer, which can also operate at lower temperatures than conventional cutter-sealers, and a method for cutting sheets of polymer film and sealing the newly cut edges together to form the closed end of a wide variety of containers. The apparatus includes a blade having integrated sealing shoulders, a seal pad, and a means for tautly holding the target film layers over the seal pad.

The blade of the cutter-sealer has a somewhat narrow, elongated cutting section that includes a distal end defining a cutting edge. The cutting section terminates on a second side opposite the cutting edge in a set of integrally formed sealing shoulders that flare outward from the cutting section. A seal pad, which is made of rubber or a similar material, provides a slot designed to receive the cutting section of the blade at the end of its cutting motion. The seal pad also provides a set of flexible contact surfaces for the blade shoulders to push against during the sealing operation. A seal pad caddy is provided to hold the seal pad securely in place.

The cutter-sealer blade divides layers of polymer film by moving the cutting section through the layers of polymer film as they are held tautly over the slot in the seal pad, with heat serving to soften the polymer film and blade pressure serving to cause tension within the polymer film in order to break the polymer film substantially along a plane defined by the path of the cutting edge. Because the cutter-sealer is dependent on applying both heat and tension to the layers of polymer film, rather than being solely dependent on heat to divide the layers of polymer film like conventional blades, the amount of heat needed to soften the layers of polymer film is substantially reduced.

Subsequent to the cutting section of the blade moving through the layers of polymer film, the blade shoulders arrest the motion of the blade as the cutting section moves into the slot in the seal pad. In this manner, the blade shoulders pin the edges of the newly cut layers of polymer film against the

flexible contact surfaces. The blade shoulders continue to apply force against the flexible contact surfaces and the pinned sections of polymer film. The applied force causes the blade shoulders to cooperate with the flexible contact surfaces to press the newly cut edges together. The flexibility of the contact surfaces smoothes out any irregularities in the surface of the layers of polymer film. As the blade shoulders pin the sections of polymer film against the contact surfaces, heat is transmitted from the blade shoulders to the layers of polymer film. The combination of heat and pressure applied to the polymer film layers creates a laminate seal that bonds the layers of polymer film together at a temperature significantly reduced from more traditional cutting and sealing devices. For example, in the case of cutting and sealing polyethylene film, the cutter-sealer of the present invention heats the layers of polyethylene film to a temperature below the liquification temperature of the polyethylene film, and seals the polyethylene layers without melting or liquifying the polyethylene film layers or otherwise heating the polyethylene film layers to a molten state.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

The above-mentioned features of the invention will become more clearly understood from the following detailed description of the invention read together with the drawings in which:

FIG. **1** is a partial perspective view of one embodiment of a cutter-sealer of the present invention.

FIG. **2** is a partial side elevation view of one embodiment of a cutter-sealer in accordance with the present invention in operation.

FIG. **3** is a side elevation view of a prior art cutter-sealer in operation.

FIG. **4** is side elevation view of one embodiment of a cutter-sealer of the present invention.

FIG. **5** is a flow diagram of one method of sealing and cutting in accordance with the present invention.

DETAILED DESCRIPTION OF THE INVENTION

A cutter-sealer allowing for reduced or eliminated polymer buildup and a method for cutting and sealing sheets of one or more layers of polymer film are hereinafter disclosed. The layers include, but are not limited to, polymers, and more specifically, polyethylene. The cutter-sealer is illustrated generally at **10** in the figures, and, as will be discussed below, is designed to operate at lower temperatures than prior art cutter-sealers, including temperatures below the melting point of the polymer film to be cut.

As illustrated in FIG. **1**, the cutter-sealer **10** includes a blade **20** that is selectively heated and a seal pad **40**. The blade **20** and seal pad **40** cooperate to allow sheets of one or more layers of film **70** to be cut and sealed in separate, but temporally proximate operations at temperatures below the melting point of the layers of film **70**. The blade **20** is designed for mounting on an arm or a machine that moves the blade in the direction of a cutting motion arrow **23** with the force necessary for the cutting and sealing operations. The blade **20** has a shank **34** that provides a stable area for mounting the blade on a mechanism that selectively advances and retracts the blade **20**. It will be understood that the shank **34** may vary in size and configuration depending upon the advancing and retracting mechanism in which it is mounted. The blade **20** is made of one or more substances that are rigid and have a relatively high degree of thermal conductivity such as aluminum, although different substances may be used. It will also be noted that in one embodiment the blade is coated with a non-stick treatment to prevent the layers of film **70** from sticking to the blade. Further, it will be understood that the longitudinal dimension **21** of the blade **20** can vary, and is generally determined by the size of the layers of film to be cut and sealed.

FIG. **2** shows the cutter-sealer **10** in operation. As illustrated, the blade **20** defines a cutting section **24** terminating in a cutting edge **22**. As will be discussed in detail below, the cutting section **24** is adapted to cut by moving through a section of film **70** held tautly across a slot **50**, defined by the seal pad **40** and adapted to receive the cutting section **24**. Further, the blade **20** defines oppositely disposed shoulders **26** that, as discussed below, serve to engage and assist in the sealing of the cut edges of the layers of film **70** once the cutting section **24** has moved through the layers of film. In the illustrated embodiment, the shoulders **26** are integrally formed with the blade. However, those skilled in the art will recognize that the shoulders **26** can be constructed separately from the blade **20** and secured to the blade **20** so as to be carried by the blade **20** without departing from the spirit and scope of the current invention. It will further be understood that the size, shape, and operating temperature of the shoulders **26** can vary substantially without exceeding the scope of the current invention.

Referring again to FIG. **1**, in order to heat the blade **20** to the desired temperature for cutting and sealing, in one embodiment, the blade **20** is provided with a heater receptacle **28** that is adapted to receive a heater element (not shown) for transferring heat to the shoulders **26** in order to seal the layers of film together. The heater receptacle **28** in the embodiment of FIG. **1** is a through opening centered between the shoulders **26** of the illustrated blade **20**. However, it will be recognized by those skilled in the art that heat may be provided to the blade **20** in different ways. Heat may be provided without the insertion of a heating element at all, or heat may be provided by the insertion of multiple heater elements. The need for a heater receptacle **28** is thus eliminated in the former situation and more than one heater receptacle **28** must be accommodated in the latter situation. Furthermore, any or all of the heater receptacles **28** in the blade **20** may vary in size, shape, position, or material. It will also be noted that, in the illustrated embodiment, the blade **20** is provided with a cooling channel **30** adapted to reduce the thermal conductivity of the blade **20** from the cooling channel **30** in the direction of the shank **34**. Accordingly, when the shoulders **26** and cutting section **24** of the blade **20** are heated to the desired operating temperature, the shank **34**, where heating is not necessary, is maintained at lower temperature. However, those skilled in the art will recognize that inclusion of the cooling channel **30** is not necessary to accomplish the cutter sealer **10** of the present invention.

As shown in FIGS. **1**, **2** and **4**, the seal pad **40** includes an elongated body **44** defining a seal pad slot **50** for receiving at least a portion of the cutting section **24** of the blade **20**. Further, the seal pad **40** defines contact surfaces **48** disposed on opposite sides of the seal pad slot **50**. As will be discussed in detail below, the contact surfaces **48** provide a surface against which the shoulders **26** of the blade **20** press to accomplish the sealing of the layers of film after such materials have been cut by the cutting edge **22**. In this regard, in one preferred embodiment of the seal pad **40**, at least the contact surfaces **48** thereof are made of a flexible material, such as rubber, the contours of which conform to the shape of the shoulders **26** of the blade **20** when the shoulders **26** are pressed against the contact surfaces **48** in order to ensure an even seal despite any

irregularities in the layers of film **70** that might exist. Moreover, the flexibility compensates for any small irregularities in the surfaces of the blade **20** and seal pad **40**.

In the illustrated embodiment, the seal pad **40** is mounted in a seal pad caddy **60** which provides a mechanism for releasably securing the seal pad **40** proximate the path of the blade **20**. The combination of seal pad **40** and seal pad caddy **60** thus creates a structure with the seal pad slot **50**, capped by the set of contact surfaces **48**, on one side but bounded on the remaining five sides by what is essentially a case made of a strong, rigid material such as aluminum. In this regard, the use of aluminum in fabrication of the seal pad caddy **60** facilitates the dissipation of heat, but it will be understood that other fabricating materials could be used. The rigidity and strength of the seal pad caddy **60** allows the seal pad **40** to be held stationary without damage. With respect to the mechanism for releasably locking the seal pad **40** in the seal pad caddy **60**, as illustrated in FIG. **4**, in one embodiment the seal pad caddy **60** defines an elongated groove **41** into which the seal pad **40** is received, with the groove **41** defining opposing slots **62**. Further, the seal pad is provided with oppositely disposed feet **42** for being slidably received in the slots **62**, and which hold the seal pad **40** in the groove **41**. It will, however, be understood that other means could be used to secure the seal pad **40** to the seal pad caddy **60**. Moreover, it will be understood that other means could be used to secure the seal pad **40** proximate the path of the blade **20** without departing from the spirit and scope of the present invention.

Referring to FIGS. **2** and **4**, in operation, the blade **20** divides the layers of film **70** by moving the cutting section **24** through the layers **70** as they are held tautly over the seal pad slot **50**. In the illustrated embodiment, the layers of film **70** are depicted as two layers of bubble film. However, those skilled in the art will recognize that the present invention may be used to cut and seal other types of film without departing from the spirit and scope of the present invention. To this extent, various polymer films, such as polyethylene film and polyolefin film, are contemplated. The blade **20** is initially heated to a sufficient temperature such that, after the blade **20** contacts the film **70**, heat sufficient to soften the film **70** without melting the film **70** is transferred to the film layers. As the blade **20** continues toward the seal pad slot **50**, the cutting edge **22** applies pressure to the tautly held polymer layers **70**, thereby creating tension in the polymer layers **70** sufficient to cause the polymer layers **70** to break substantially along the softened section of film. Because the cutter-sealer **10** is dependent on applying both heat and tension to the layers of polymer film **70**, rather than being solely dependent on heat to divide the layers of polymer film **70** like conventional blades, the amount of heat needed to soften the layers of polymer film is substantially reduced. Those skilled in the art will recognize that the exact temperature sufficient to heat the blade **20** is dependent upon the specific material to be cut and sealed, together with the number of layers to be cut and the thickness of the layers. However, it will be understood that temperatures insufficient to liquefy the specific polymer film to be cut are contemplated.

As mentioned above, the operation of the cutter-sealer **10** contemplates that the layers of film be held tautly over the seal pad slot **50** such that pressure from the advancing blade **20** causes tension within the tautly held film **70**, thereby causing the film **70** to break. Such breaking of the film **70** occurs substantially along a plane defined by the path **23** of the cutting edge **22**, thereby allowing the blade **20** to continue through the film **70** and into the slot **50** without carrying the film layers **70** into the slot **50**. As illustrated in FIGS. **2** and **4**, in one embodiment, the polymer layers **70** are held tautly over the seal pad slot **50** by a set of film clamps **80** that press the layers of film **70** on either side of the seal pad slot **50** against surfaces provided by the seal pad **40** and seal pad caddy **60**. However, other means of holding the layers of film tautly over the seal pad slot **50** may be used without departing from the scope and spirit of the current invention or altering the result.

In the embodiment of FIGS. **2** and **4**, the cutter-sealer **10** is configured to cut two layers of polymer film, each layer of polymer film being approximately one one-thousandth of an inch in thickness. In this embodiment, after placement of the film **70** over the seal pad **40** in adjacent or substantially adjacent parallel planes, two film clamps **80** contact the seal pad caddy **60** to exert force against the film **70**, thereby holding the film **70** with sufficient force over the seal pad **40** to restrain the film **70** proximate the seal pad **40**.

Those skilled in the art will recognize that the exact force necessary to achieve suitable tautness of the layers of film **70** over the seal pad slot **50** will vary depending upon the properties of the specific material to be cut, the number of layers to be cut, the thickness of each of the layers, and the available clamping surface of the film clamps **80**. As such, the film clamps **80** may be configured to exert any amount of force against the layers of film **70** necessary to secure the film **70** proximate the seal pad **40** so as to allow the blade **20** to break the film **70** substantially along the plane defined by the path of the cutting edge **22** after heat from the blade **20** softens the layers of film **70** without causing the blade **20** to carry the film layers **70** into the seal pad slot **60**. For example, in one embodiment utilizing two film clamps **80**, each film clamp being approximately one inch in length along the surface of the film **70**, the film clamps **80** cooperate to exert a combined force of approximately 45 pounds against the seal pad caddy **60**. In this embodiment, approximately 22.5 pounds per linear inch of clamp **80** is exerted against the film layers **70**. In another embodiment utilizing two film clamps **80**, each film clamp being approximately fourteen inches in length along the surface of the film **70**, the film clamps **80** cooperate to exert a combined force of approximately 190 pounds along the length of the seal pad caddy **60**.

As shown in FIG. **2**, after heating of the blade **20** and advancement of the film clamps **80**, the blade is continued along the path of travel **23** toward the seal pad slot **50**. Upon contact with the blade **20**, heat is transferred to the film **70**, causing the contacted portion of the film layers to soften. The blade **20** continues along the path **23**, exerting pressure on the film **70** and causing the film **70** to break substantially along a plane defined by the path **23** of the cutting edge **22**. In one embodiment, the cutting edge **22** defines a sharp edge so that the blade **20** can easily divide the layers of film **70**. However, it will be apparent to one skilled in the art that the combination of heat transferred to the film **70** to soften the film, together with the operation of the film clamps **80** to hold the layers of film tautly over the seal pad slot **50**, allows for division of the film layers **70** using a blade **20** having a cutting edge **22** which is less sharp than the blades of several conventional prior-art cutter-sealers. To this extent, in the present embodiment, the cutting edge **22** has a radius of curvature of approximately ten one-thousandths of an inch. However, it will be understood that the radius of curvature of the cutting edge **22** may vary, depending upon the particular type and thickness of material to be cut, as well as the amount of heat transferred to the film layers **70** by the cutting edge **22** and the amount of force exerted by the film clamps **80**, without departing from the spirit and scope of the current invention.

Subsequent to the cutting section **24** of the blade **20** moving through the layers of film **70**, the motion of the blade **20** is arrested as the blade shoulders **26** press the newly cut layers

of film **70** against the contact surfaces **48**. In this manner, the blade shoulders **26** pin the edges of the newly cut layers of polymer film **70** against the contact surfaces **48**. The blade shoulders **26** continue to apply force against the contact surfaces **48** and the pinned sections of polymer film **70**. The applied force causes the blade shoulders **26** to cooperate with the contact surfaces **48** to press the newly cut edges together. The flexibility of the contact surfaces **48** smoothes out any irregularities in the surface of the layers of polymer film **70**. At the same time, the blade shoulders **26** transfer heat to the newly cut edges of the layers of film **70** to seal them together. By applying both heat and pressure to the edges of the layers of film **70**, rather than merely applying heat, the seal is accomplished at a temperature significantly reduced as compared to more traditional cutting and sealing devices, thereby allowing the blade **20** to be maintained at lower temperatures for most layers of film **70**. For example, in the case of cutting and sealing polyethylene layers, the seal is accomplished without melting or liquefying the sealed portions of the layers of film **70**. Of course, the desired or optimum temperature of the blade **20**, and the desired or optimum length of time during which pressure is applied to the layers of film **70** by the blade shoulders **26**, varies depending upon the particular characteristics of the layers of film being cut and sealed.

In this regard, the characteristics of the present invention may be more clearly understood when viewed in light of certain prior art. FIG. **3**, for example, shows a prior art cutter-sealer **100** of similar design to the device in U.S. Pat. No. 5,056,295, issued to Williams. In the prior art device of FIG. **3**, a mounting member **150** is provided, onto which a pair of heating elements **110** is secured. A sharpened blade **120** is held between the heating elements **110** and heated to a temperature significantly above the melting point of the polymer material. A pair of clamping plates **180** is mounted on a spring mechanism **130** so as to extend toward a seal pad **160** defining a shallow seal pad slot **140**.

In using the prior art cutter-sealer **110** of FIG. **3**, sheets of one or more layers of polymer materials **170** are positioned in adjacent or nearly adjacent parallel planes and are placed between the heated blade **120** and a seal pad **160**. As the blade **120** and heating elements **110** move toward the seal pad **160**, the clamping plates **180** are carried on the spring mechanism **130** toward the seal pad **160**. The clamping plates **180** contact the seal pad **160**, whereupon the spring mechanism **50** yields to permit the clamping plates to push no further into the seal pad than necessary to secure the film **170** against movement of the film **170** proximate the action of the blade. The heated blade **120** continues to advance toward the seal pad **160**, melting through the polymer materials **170**, and pushing molten polymer material to each side as the heating elements **110** press against the seal pad **120**. The seal in the prior art cutter-sealer **100** is actually formed by molten polymer material **170** pushed aside by the blade **120** and formed by the heating elements **110** contacting the polymer material **170**.

When the blade **120** of FIG. **3** is heated to temperatures known commonly in the prior art, the molten polymer material pushed to each side of the blade **120** as the blade **120** moves through the polymer layers **170** tends to form into small beads of molten polymer that result in residue being deposited on the heated blade **120**. By contrast, in the present invention (see FIG. **2**), the cutting edge of the blade **20** moves through the broken layers of film **70** before sealing of the broken film layers occurs. Through this feature, the cutter-sealer **10** at least reduces the buildup of molten polymer materials on the cutting section **24** of the blade **20**, and in many embodiments eliminates buildup of molten polymer materials on the cutting section **24** of the blade **20** altogether. Furthermore, the sequence of breaking of the layers of film **70** prior to sealing of the cut film layers allows the cutting section **24** of the blade to be maintained at a significantly lower temperature than other prior art devices.

FIG. **5** provides a flow diagram illustrating one method **300** for cutting and sealing layers of film **70** in accordance with the present invention. The first steps are to determine the temperature to which the blade **20** must be raised to seal the layers of film **70** (referenced at **310**) and to determine the cutting force which the blade **20** must exert against the layers of film **70** to cut them (referenced at **314**). For example, for a polyethylene film having a thickness of one thousandth of an inch, the blade **20** temperature is preferably between 190 and 220 degrees Fahrenheit. (A conventional method and device would require temperatures between 325-360 degrees Fahrenheit). The blade **20** is then heated to the previously determined temperature as referenced at **318**. The layers of film **70** are then held tautly across the seal pad slot **50** until the blade **20** cuts and seals the layers of film, and the blade is retracted as referenced at **322** in FIG. **5**. The blade **20** is then moved with the predetermined cutting force through the layers of film **70** so that the shoulders **26** of the blade cooperate with the contact surfaces **48** to engage the newly cut edges of the layers of film **70** as referenced at **326**. The blade **20** is then held in that position with a predetermined pressure applied **330** until conditions indicate **334** that it is time to retract the blade **20** as referenced at **330**. Finally, the blade **20** is retracted from engagement with the seal pad **40** and the layers of film **70** as referenced at **334** and **338**.

From the foregoing description, it will be recognized by those skilled in the art that a cutter-sealer **10** and associated method **300** for cutting and sealing layers of film **70** together has been provided. The cutter-sealer **10** and method **300** provide a means of cutting layers of film **70** at lower temperatures than is possible with prior art devices. As a result there is reduced or eliminated buildup of film material on the blade **20**, and the overall cutting and sealing operation is safer. Furthermore, it will be understood to one skilled in the art that the cutter-sealer **10** of the present invention provides the advantage of applying both heat and pressure to cut layers of film **70** prior to sealing of the film layers, thereby allowing for more thorough and uniform sealing of the severed film layers **70**.

While the present invention has been illustrated by description of several embodiments and while the illustrated embodiments have been described in considerable detail, it is not the intention of the applicant to restrict or in any way limit the scope of the appended claims to such detail. Additional advantages and modifications will readily appear to those skilled in the art. The invention in its broader aspects is therefore not limited to the specific details, representative apparatus and methods, and illustrative examples shown and described. Accordingly, departures may be made from such details without departing from the spirit or scope of applicant's general inventive concept.

I claim:

1. A cutter-sealer for cutting and sealing layers of film, said cutter-sealer comprising:

a blade for being selectively heated and for cutting and sealing the layers of film, said blade having:

a cutting section with a distal portion defining a cutting edge, said cutting edge being adapted to transfer heat from said blade to the layers of film sufficient to soften a portion of the layers of film along said cutting edge without liquifying the layers of film; and

at least one first blade shoulder fixed proximate said cutting section rearward of said cutting section, said at

least one first blade shoulder being adapted to transfer heat to the layers of film; and

a second blade shoulder fixed proximate said cutting section and oppositely disposed to said first blade shoulder;

wherein said blade defines a heater receptacle adapted for receiving a heating element;

a seal pad fabricated of a flexible material, said seal pad defining a seal pad slot adapted for receiving at least a portion of said cutting section of said blade, said seal pad further defining at least a first contact surface proximate said seal pad slot adapted to cooperate with said at least one first blade shoulder to engage the layers of film and press the layers of film together, said seal pad further defining a second contact surface proximate said seal pad slot;

a seal pad caddy for carrying said seal pad, wherein said seal pad caddy defines at least a first material fixation surface; and

a means for selectively securing the layers of film proximate said seal pad slot, wherein said means for securing the layers of film proximate said seal pad slot includes at least one film clamp adapted to cooperate with said first material fixation surface to engage the layers of film and hold the layers of film tautly across said seal pad slot;

whereby after said cutting edge contacts the layers of film to heat and soften the layers of film without liquefying the layers of film, at least a portion of said cutting section of said blade travels through the layers of film and into said seal pad slot, thereby dividing the layers of film and allowing said at least one first blade shoulder to press the layers of divided film against said at least one first contact surface to accomplish sealing of the layers of divided film and whereby at least a portion of the layers of divided film are pressed between said second blade shoulder and said second contact surface to accomplish the sealing of the layers of film.

2. The cutter-sealer of claim **1** wherein said seal pad caddy defines a second material fixation surface disposed on the opposite side of said seal pad slot from said first material fixation surface, and wherein said means for securing the layers of film proximate said seal pad slot includes a second film clamp adapted to cooperate with said second material fixation surface to engage the layers of film, said first film clamp and first material fixation surface cooperating with said second film clamp and said second material fixation surface to hold the layers of film tautly across said seal pad slot.

3. The cutter-sealer of claim **2** wherein at least said cutting section of said blade is coated with a non-stick coating.

4. The cutter-sealer of claim **2**, wherein said first and second blade shoulders are integrally formed with said blade.

* * * * *

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I, Andrew C. Lake, hereby certify pursuant to Fed. R. App. P. 25(d) that, on August 8, 2014 the foregoing Brief for Defendants-Appellants was filed through the CM/ECF system and served electronically on the individual registered on the courts CM/ECF system.

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By: /s/*Andrew C. Lake*
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